Title: Systems And Methods For
Voxel Warping
Inventor: Payne
Serial No. Not Yet Assigned
Atty Docket No. SNS-009A (7268/15)
Atty/Agent: Joseph B. Milstein

102~ define geometrical shape as an array

104~ select modification function

106~ apply an inverse function of the modification function to the array

select a second modification function ~114

108~ deduce from the modified array a modification of the geometrical shape

apply an inverse function of the second modification function to the modified array ~116

110~ OPTIONALLY apply the deduced modification to the array.

deduce from the twice-modified array a modification of the geometrical shape ~118

112~ OPTIONALLY display to a user the modification of the geometrical shape.

Figure 1

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```
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  1  1  1  1  1  1  1  1   202
0  0  1  2  2  2  2  2  2  2
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
```
204

Figure 2A

```
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  1  1  1  1  1  1  1  1   202
0  0  1  2  2  2  2  2  2  2
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
```
204'

Figure 2B

```
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  1  1  1  1  1  1  1  1   202
0  0  1  2  2  2  2  2  2  2
0  0  0  1  2  3  3  3  3  3
0  0  0  1  2  3  3  3  3  3
0  0  0  1  2  3  3  3  3  3
0  0  0  1  2  3  3  3  3  3
0  0  0  1  2  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
```
204

Figure 2C

```
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  1  1  1  1  1  1  1  1   202
0  0  1  2  2  2  2  2  2  2
0  0  0  1  2  3  3  3  3  3
0  0  0  1  2  3  3  3  3  3
0  0  0  1  2  3  3  3  3  3
0  0  0  1  2  3  3  3  3  3
0  0  0  1  2  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
0  0  1  2  3  3  3  3  3  3
```
204

Figure 2D

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Rmax

310

0

0   Rmax

Figure 3

410

Rmax

0

0   Rmax

Figure 4

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A - Unmodified voxels
B - Resampled voxels
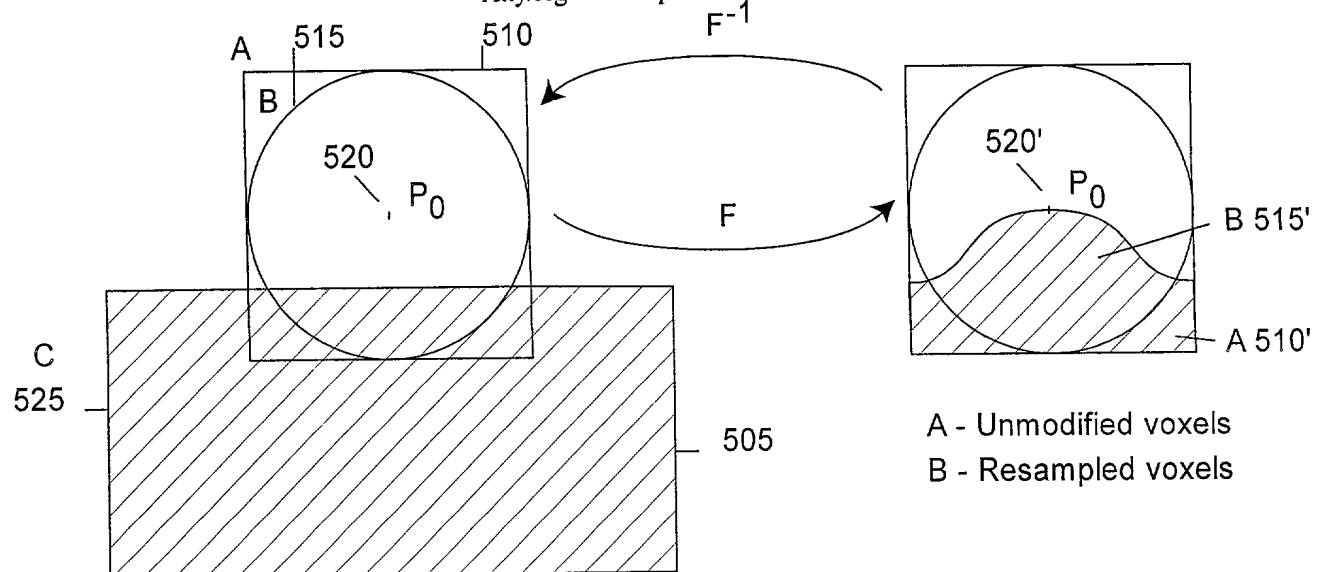
A - Scratch buffer region
B - Region of influence for warp
C - Original voxel model
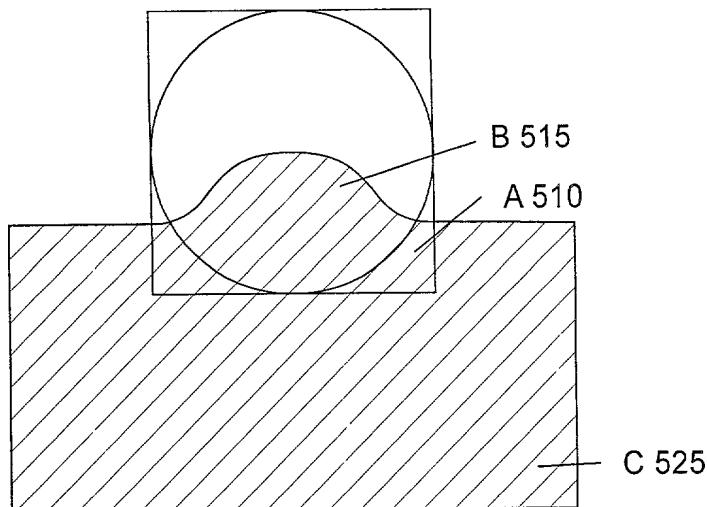
Figure 5

Figure 6

Figure 7

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Figure 8
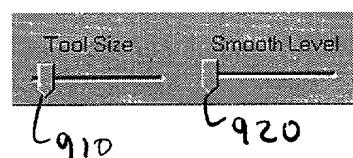
Figure 9
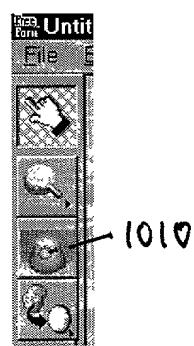
Figure 10
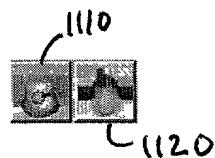
Figure 11

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Tool Size   Hard   Soft

1210   1220   1230

Figure 12

Tool Size   Hard   Soft   Area of Influence

1210   1220   1350   1340

Figure 13

1410

Tool Size   Hard   Soft   Smooth

1400   1420

Figure 14

Tool Size   Hard   Soft   Smooth   Area of Influence   Smoothing Level

1530   1510   1520
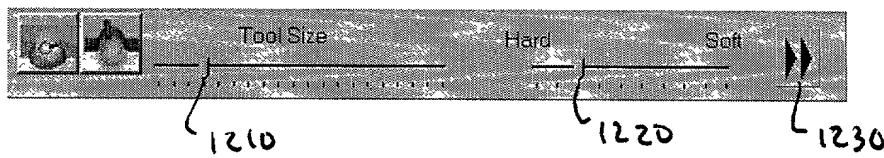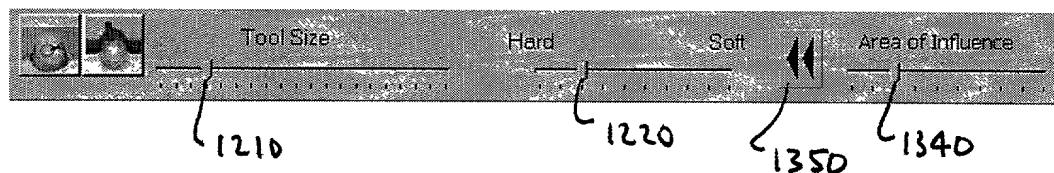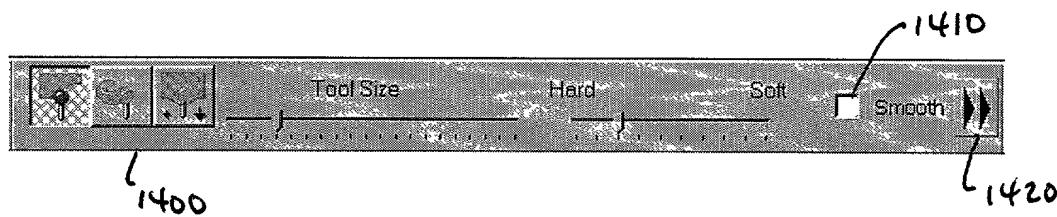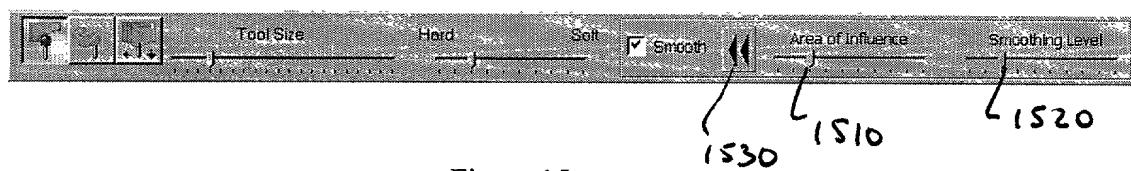
Figure 15

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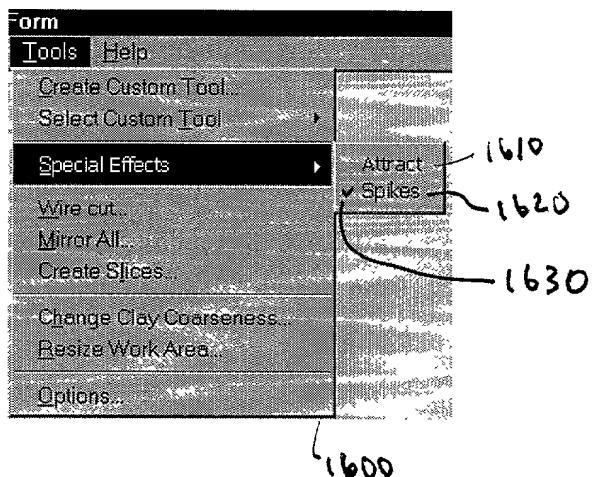
Figure 16
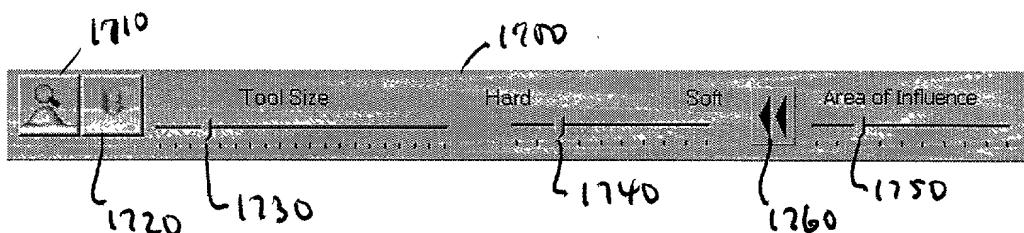
Figure 17
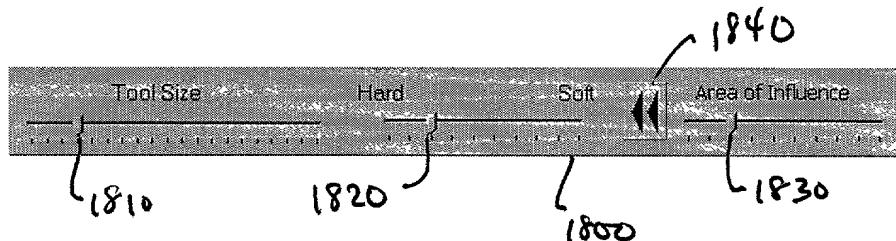
Figure 18
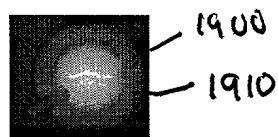
Figure 19

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(a) (b) (c)

Original Tool Scaled Tool Offset Tool

(d) (e) (f)

Figure 20